SECTION 15628 - ROTARY LIQUID CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes outdoor air cooled reciprocating water chillers.

B. Related Sections include the following:
1. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for chiller vibration isolation requirements.
2. Division 15 Section "Hydronic Piping" for chiller piping requirements.
3. Division 15 Section "HVAC Controls" for temperature-control devices for chillers.
4. Division 15 Section "Sequence of Operation" for temperature-control sequences for chillers.

1.3 SUBMITTALS

A. Product Data: Include refrigerant; rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model indicated.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. ASHRAE Compliance: Comply with ASHRAE 15 for chiller design, construction, leak testing, and installation.

C. ASME Compliance: Comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," for constructing and testing evaporator and condenser pressure vessels. Stamp with ASME label.

D. UL Compliance: Comply with UL 465.

E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver water chillers with protective crating and covering.

B. Store chillers to prevent damage and protect from weather, dirt, fumes, water, and construction debris.

C. Handle chillers according to manufacturer's written rigging and installation instructions for unloading, transporting, and setting in final location.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty on Refrigerant Compressor: Written warranty, signed by manufacturer agreeing to repair or replace compressor, including replacement of refrigerant.

1. Warranty Period: Manufacturer's standard, but not less than five years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Outdoor Air-Cooled Rotary Water Chillers:
a. Carrier Corp.
b. Dunham-Bush, Inc.; DunhamBush Compressors Div.
c. McQuay Air Conditioning.
d. Trane Co. (The).
e. York International Corporation.

2.2 COMPRESSORS

A. Description: Semi-hermetic rotary screw compressor, direct drive, capacity control slide valve, differential refrigerant pressure oil pump and oil heater.

B. Refrigerant: HCFC-22; full operating charge of refrigerant and oil.

2.3 EVAPORATOR

A. Description: Direct-expansion, shell-and-tube design.

B. Tubes: Seamless copper expanded into tube sheets.
   1. Refrigerant Working Pressure: 300 psig (2070 kPa).
   2. Water-Side Working Pressure: 215 psig (1480 kPa).

C. Insulation: Factory applied to evaporator, suction lines, and other surfaces where condensation might occur, with 3/4-inch- (19-mm-) thick, flexible elastomeric insulation.

D. Evaporator Heater: Factory-installed electric heater with capacity to protect evaporator to minus 25 deg F (minus 33 deg C) ambient temperature.

2.4 REFRIGERANT CIRCUIT ACCESSORIES

A. Two refrigerant circuits, each with the following specialties:
   1. Suction and discharge shutoff valves.
   2. Refrigerant charging connection.
   3. Hot-gas muffler.
   4. Solenoid valve in liquid line.
   5. Filter/dryer with replaceable core.
   6. Sight glass and moisture indicator in liquid line.
   7. Pressure-relief valve.
   8. Thermal expansion valve.

2.5 AIR-COOLED CONDENSER

A. Exterior Casing: Manufacturer's standard equipment casing coated with corrosion-resistant exterior finish and with removable doors or panels for service and inspection.

B. Coils: Seamless copper tubing mechanically jointed to aluminum fins. Factory test coils for leaks to minimum test pressure of 425 psig (2930 kPa).

C. Coil Grilles: Louvered, galvanized steel mesh.

D. Fans: Direct drive, statically and dynamically balanced, with fan guards.

E. Fan Motors: Three-phase, integral overload protection, and permanently lubricated bearings.

2.6 CONTROL PANEL

A. Manufacturer's standard microprocessor-based chiller controls; unit mounted, and factory wired with a single-point power connection and separate control circuit.

B. Status Display: Include the following conditions:
1. Date and time.
2. Operating or alarm status.
3. Operating hours.
4. Entering-chilled-water temperature.
5. Leaving-chilled-water temperature.
6. Evaporator refrigerant temperature.
7. Entering-condenser-water temperature.
8. Leaving-condenser-water temperature.
9. Evaporator pressure.
10. Condenser pressure.
11. Electronic expansion valve position.
12. Control set points.

C. Control Functions: Include the following:
1. Manual or automatic startup and shutdown time schedule.
2. Leaving-chilled-water temperature reset from entering-chilled-water temperature.
3. Electric demand limiting through compressor lockout.
4. Antirecycling timing-out to prevent rapid compressor cycling.
5. Automatic lead-lag switching.
6. Chilled-water temperature reset based on outdoor-air or space temperature.
7. Start and run during low ambient air temperature.
8. Remote running and alarm indication contacts.

D. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:
   1. Refrigerant low pressure.
   2. Evaporator low temperature.
   3. Refrigerant high pressure.
   4. Low oil flow or pressure.
   5. No chilled-water flow.
   6. No condenser-water flow.
   7. Control device failure.
   8. Low control voltage.
   9. Compressor motor current-overload protection.

E. Building Management System Interface: Factory-installed hardware and software to enable building management system to monitor and control chilled-water set point and chiller-control displays and alarms.

2.7 MOTOR STARTER

A. Power Controls: Combination controller and disconnect with part-wind starting.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect chiller heat exchangers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

B. Verification of Performance: Rate reciprocating water chillers according to ARI 590, "Positive Displacement Compressor Water-Chilling Packages."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive chillers for compliance with requirements for installation tolerances and other conditions affecting chiller performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Final chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in piping and electrical connections.

3.2 INSTALLATION

A. Install chillers level and plumb, and anchor to base.

B. Maintain manufacturer's recommended clearances for service and maintenance.

C. Electrical Wiring: Install electrical components, devices, and accessories furnished loose by manufacturer, including remote flow switches and remote chiller control panel.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
   1. Install piping adjacent to machine to allow service and maintenance.
   2. Connect chilled-water piping according to Division 15 Section "Hydronic Piping." Connect to supply and return with shutoff valve and union or flange at each connection.

B. Electrical: Comply with Division 16 Sections.

C. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and chiller installation, including piping and electrical connections. Report results in writing.

3.5 CLEANING

A. After completing installation, including outlet fittings and devices, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

3.6 COMMISSIONING

A. Verify that installation complies with the Contract Documents.

B. Engage a factory-authorized service representative to perform startup service.
   1. Fill out startup checklists and attach copy with Contractor Startup Report.

C. Complete installation and startup checks according to manufacturer's written instructions and check for the following items:
   1. No physical damage to unit.
   2. Unit is level.
   3. Chiller vibration isolation and flexible pipe connections are installed.
   4. Clearances have been maintained and piping is installed for easy removal for service and tube cleaning.
   5. Chilled- and condenser-water pipes have been connected to correct ports.
   6. Labels and safety instructions are clearly visible.
   7. Oil levels are as recommended by manufacturer.

8. Refrigerant charge is sufficient and chiller has been leak tested.
9. Shipping skids, blocks, and straps are removed.
10. Refrigerant pressure relief is vented to outside.
11. Thermometers and pressure gages are installed.
12. Controls and safety interlocks are installed and connected.
13. Pumps are installed, connected, and operational.

D. Check and record performance of chiller protection devices.

E. Check and record performance of chilled- and condenser-water flow and low-temperature interlocks.

F. Operate chiller for run-in period as recommended by manufacturer.

G. Check static deflection of vibration isolators, including deflection during chiller startup and shutdown.

H. Check refrigerant charge. Check oil level.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chillers as specified below:
1. Train Owner's maintenance personnel on procedures and schedules for starting up and shutting down, troubleshooting, servicing, and maintaining chillers. Provide minimum 4 hours operator training.
2. Review data in maintenance manuals. Refer to Division 1.
3. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION 15628